24. HYDROLOGY OF A LENTIC WATER BODY AND ITS SIGNIFICANCE IN PLANKTON PRODUCTION

(*With a text-figure*)

The paper describes the seasonal variation of physico-chemical factors of Undasa Pond (Madhya Pradesh) for one year from January to December 1978. The surface water was found always alkaline, with pH ranging from 7.6 to 8.1. Dissolved oxygen varied from 4.0 to 8.4 mg/L in March. Very low transparency was found in monsoon season (July to September). Free carbondioxide in surface water was recorded during July, August and September. An interrelationship with pH, dissolved oxygen, alkalinity with total volume of plankton was also recorded. The high alkalinity and low visibility indicate eutrophic nature of the pond. The high chloride content may be due to animal pollution.

Introduction

Undasa Pond is used mainly for irrigation. However pisciculture is also undertaken in it by Madhya Pradesh Government Fisheries Department. The pond has an area of 212 hectares. It is situated in Undasa village about 4-5 km from Ujjain at Ujjain-Makshi Road. An embankment has been constructed around the three sides of the pond to store water in rainy season. The pond is perennial.

Material and Methods

The study of physico-chemical factors and total plankton volume was made on every 15th of the month for 1978. The temperature of surface water was measured by 110°C graduated thermometer and transparency by Secchi's disc. pH was determined by narrow range pH paper and B.D.H. universal indicator in the field and by pH meter (systronix — 322) in the laboratory. Dissolved oxygen was estimated by unmodified winkler's method and free CO_2 was determined by method given by Welch (1952). Carbonate, bicarbonate, inorganic phosphate, nitrate-nitrogen and chloride were estimated by standard methods (American Public Health Association 1955). Surface water from a definite place and depth was always used for above analysis. Plankton volume was noted by filtering 100 litres surface water through plankton net of bolting silk No. 20 and after settling in graduated test tube, all samples were analysed within an hour of collection.

Result and Discussion

The summary of the observations is given in Table 1 and Fig. 1.

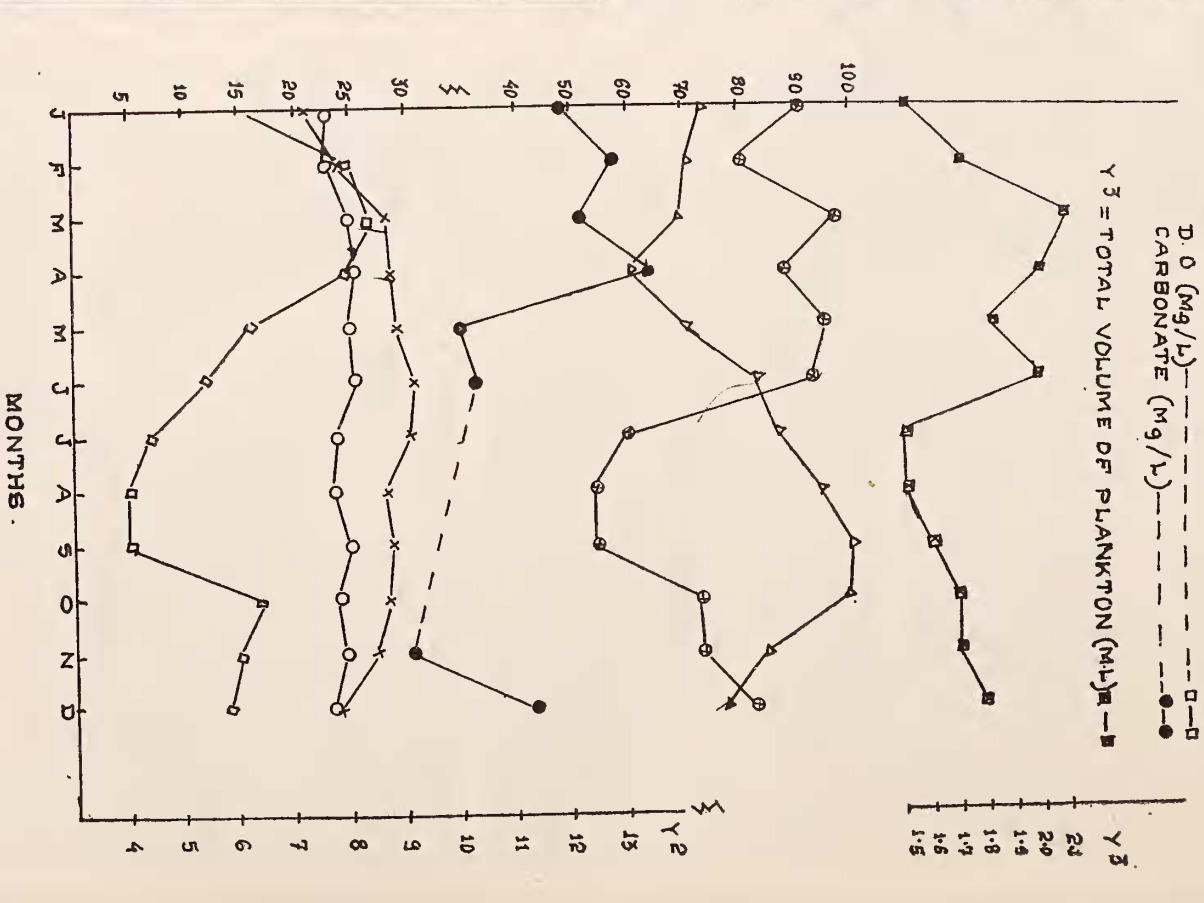
Temperature. This is one of the most important hydrobiological factors related to fish production (Das & Pathani 1978). Surface water temperature of Undasa Pond revealed that there was seasonal variation. The temperature was found to increase from January to June when highest temperature was recorded. The temperature dropped from June to December with exception in September. The decrease in temperature in July and August was most probably due to cloudy atmosphere and rain. The heavy influx of rain water from neighbouring areas may be another reason for low temperature. The lowest temperature was recorded in January. The monthly water tem-

TABLE 1

MONTHWISE VALUE OF PHYSICO-CHEMICAL AND BIOLOGI CAL CHARACTERISTICS OF UNDASA POND DURING 1978.

	Physical characteristics						Chemical characteristics				
Months	Water temp. (°C.)	Transparency (cm)	pH	Dissolved oxygen (mg/L)	Carbonate (mg/L)	Biocarbonate (mg/L)	Free carbondioxide (mg/L)	Chloride (mg/L)	Phosphate inorganic (mg/L)	Nitrate Nitrogen (mg/L)	Value* (Plankton)
January	21.0	91.3	7.6	6.0	11.8	73.6	—	8.3	0.08	0.04	1.5
February	24.0	79.9	7.8	8.0	12.7	70.8	—	8.3	0.079	0.035	1.7
March	28.3	98.0	8.0	8.4	12.1	70.3	—	8.8	0.075	0.03	2.1
April	29.0	88.0	8.1	8.0	13.4	60.3	—	8.5	0.08	0.03	2.0
May	29.3	96.0	8.0	6.2	10.0	70.1	—	9.3	0.12	0.04	1.8
June	31.0	93.5	8.1	5.4	10.3	83.5	—	8.7	0.08	0.03	2.0
July	30.6	59.6	7.8	4.4	—	87.3	2.0	8.1	0.10	0.08	1.5
August	28.7	54.0	7.7	4.0	—	96.0	2.5	8.1	0.07	0.08	1.5
September	28.9	54.5	8.0	4.0	—	100.7	2.4	8.0	0.08	0.06	1.6
October	28.4	73.0	7.8	6.4	—	100.0	2.5	8.3	0.10	0.035	1.7
November	27.5	73.4	7.9	6.0	9.1	85.0	—	8.4	0.08	0.035	1.7
December	24.8	83.0	7.7	5.8	11.3	78.3	—	8.3	0.08	0.04	1.8

* Value ML/100 litres



(Fig. 1)

perature in the pond changes alongwith the change in air temperature (Oppenheimer *et al.* 1978). The temperature difference between lowest and the highest was noted as 10°C in Undasa Pond while Srivastava *et al.* (1979) noted it as 10.2°C in a Govindgarh lake, Rewa.

Transparency. Seasonal changes in transparency were quite apparent (Table 1). The transparency of a pond depends upon the

turbidity of water (Hitchinson 1957), which is caused by silting, micro-organisms and suspended organic matters in the water (Khan & Siddiqui 1974). The Secchi's disc readings have usually been converted into the depth at which 1% light was present (Strickland 1958, Riley 1941, Norden 1968). In present study visibility values varied from 54 cm to 98 cm. Thus euphotic depth of Undasa Pond appears to be from 135 cm to 228.25 cm (conversion factor = 2.5 as followed by Khan & Siddiqui 1974). This indicates that production is only limited to a narrow upper belt of water while rest of the depth is consuming and unproductive. The low transparency noted in rainy season which may be attributed to colloidal mud particles brought about by in coming water and to increased depth of water. Ganapati (1962) reported transparency variation from 50 cm to 120 cm in Red hill reservoir, Tamil Nadu. George (1976) found transparency variation from 47.4 cm to 85.5 cm in Lower Lake, Bhopal and attributed to low transparency during summer monsoon due to degeneration of blue-green algae which reduce the light penetration. Khan & Siddiqui (1974) reported transparency variation from 33.7 cm to 56.3 cm in a perennial fish pond in Aligarh. Disappearance of Secchi's disc throughout the year in Undasa Pond demonstrates the degree of eutrophication occurring in the pond. The pond receives rain water from the catchment area which carries effluents, inorganic compounds and particulate matters in the pond which have converted the pond to an eutrophic condition. Similar eutrophic condition was noticed in Nainital Lake by Das & Pathani (1978).

H-ion concentration. The pH of lake water has an important bearing on both plankton and fish production (Das 1961). The pH of surface water of the pond was found within alkaline range (7.6-8.1). The high pH during March, April, May, June and September may be due to high photosynthetic activity. Das & Srivastava (1956) and Sreenivasan (1963) found that a pH of 7.2-8.5 is only favourable for the growth of plankton although the best is 7.2-8.0. Thus the pH of Undasa Pond is suitable for plankton and fish production. Swarup & Singh (1979) reported pH variation from 7.4-8.9 in a Suraha Lake. Clearcut increase in pH of Undasa Pond was noticed from January to April while thereafter the pattern was irregular.

Dissolved Oxygen. From the investigations in the Undasa Pond it was found that dissolved oxygen increased from January to March and may be attributed to low temperature and high photosynthetic activity. During monsoon oxygen concentration was very low because of influx of turbid drainage water, low phytoplankton population and partly due to increased respiration caused by organic matter accompanying the drainage water (Khan & Siddiqui 1974). The highest dissolved oxygen content was recorded in March. The low oxygen content during May and June may be due to low water level, high temperature and death and decay of macrovegetation. Ellis (1946) also stated that the respiratory activity of animals dwelling in the area and decay of dead organic substances are the chief causes of under saturation and depletion of oxygen in tropical waters.

Carbonate, bicarbonate and free carbondioxide. The increased quantity of carbonate alkalinity during cold weather (January to April) showed photosynthetic activity while decrease in bicarbonate in Undasa Pond during cold weather may be due to its absorption by phytoplankton and aquatic macrovegetation. An inverse correlation between carbonate alkalinity and bicarbonate alkalinity was found in

Undasa Pond. The carbonate value was absent during July, August, September and October when free CO_2 in surface water was present. This may again be attributed to low photosynthesis. Jana (1974) found total absence of carbonate alkalinity for a major part of the year in a pond at Santiniketan while Ganapati (1962) found that surface water in Red hill reservoir contained carbonate alkalinity throughout the year. The high value of total alkalinity may be due to pollution, abundance of macrovegetation, and organic materials entering into the pond with rain water. Das & Akhtar (1970) found that increase in alkalinity is due to pollution, decrease in water level and seepage.

Chloride. High chloride content was present all the year round. The high chloride content is indicative of pollution derived from animals which regularly visit the water. George (1976) reported influx of drainage water and temperature controlling the chloride content in the Lower Lake of Bhopal.

Inorganic phosphate and nitrate-nitrogen. Both the values were in traces only. In Undasa Pond phosphate and nitrate were highest during the monsoons which may be due to rain washings, destruction of cell protoplasm by bacteria and destruction of agencies consuming the nutrients, Poor phosphate and nitrates were also recorded by Mathew (1975) in a Govindgarh lake. Ghosh *et al.* (1974) recorded high phosphate and nitrate in sewage-fed fish pond and Sreenivasan (1972) recorded extremely high value of PO^4-P up to 22 ppm in Vellore Moat. However according to Hora & Pillai (1962, 114) the highest plankton production which in turn allows for maximum fish production occurs when the water contains 4 ppm of nitrogen with 1 ppm of phosphorus and 1 ppm of potassium.

Correlation of various physico-chemical factors with total volume of plankton

An interrelationship was observed among pH, oxygen, carbonate, bicarbonate alkalinity and plankton volume in the present study of Undasa Pond (Fig. 1). The pH increased gradually from January to April and then declined until minimum was reached in August. The dissolved oxygen content showed increase from January to March and then decreased till August-September. The carbonate alkalinity also showed similar pattern and bicarbonate indicated a reverse relationship with all the three parameters (Fig. 1). The total volume of plankton was directly related to pH, dissolved oxygen and carbonate alkalinity and inversely related to bicarbonate content. The water was always alkaline. Sreenivasan (1963) reported that pH of 7.2 to 8.5 is only favourable for plankton growth. The pH of Undasa Pond is between above range. No distinct relationship among total volume of plankton, phosphate and nitrate was noted. Prescott (1939) stated that phosphorus correlated with plankton productivity, whereas Juday & Birage (1931) found evidence of phosphorus as limiting factor in phytoplankton growth. Saha *et al.* (1971) also observed that nitrate and phosphate are not always correlated with plankton growth.

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25. A NEW RECORD OF *PYEMOTES* SP. (PEDICULOIDES) OF MITE PARASITIZING THE COMMON INDIAN HOUSE FLY — *MUSCA DOMESTICA NEBULO* FABR.

(With a text-figure)

Dhiman (1981) reported for the first time a mite, *Microtrombidium* sp. parasitizing the house fly. During the collection of house flies for recording the data of infestation of this species of mite, we came across another species of mite, *Pyemotes* sp. (Acarina-Pyemotidae) also parasitizing the house flies in good number. This is an extremely small mite being 0.12 ± 0.05 mm in length and 0.05 ± 0.02 mm in width. The body is elongated and yellowish white in colour. Gnathosoma is conspicuous and retractable. Chelicerae and padipalps are minute in size. Palpi are closely appressed to rostrum. Body setae well developed, six pairs of dorsal setae and four pairs of ventral setae. Coxal apodemes are obvious. A club shaped hair is present posterior to the base of first leg on each side. A few tarsal setae are considerably long than others, specially of first and 3rd leg. Claws well developed and curved. Claws of fore leg stouter and shorter in size. A membranous empodium is present in between the claws of second to fourth legs. A pair of small eyes are present, each one on lateral sides of dorsum (scutum) (Fig. 1).

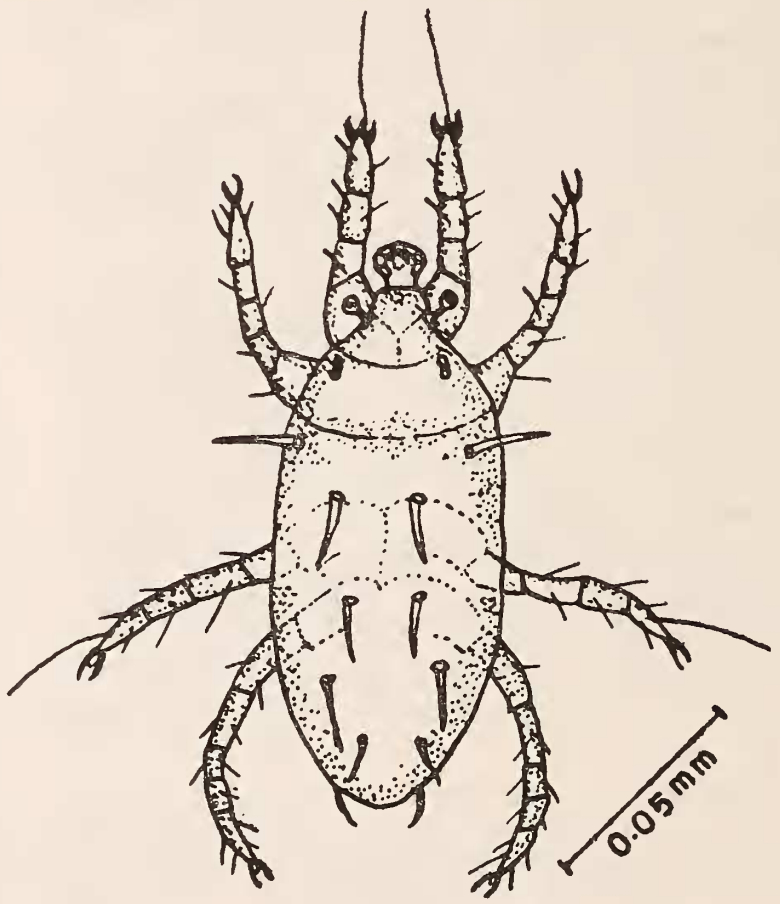

Fig. 1. Dorsal view of the *Pyemotes* sp. of mite.

The mite parasitizes the house fly from March to October which are the warmer months in this region. During this period both the host and the mite multiply rapidly while during the winter months, November to Febru-